

ing at sea were transmitted daily to the Weather Bureau office at San Francisco. These were carefully plotted from day to day and were utilized with good results by the forecast official.

The Commercial Pacific Cable Company is now (June, 1903) laying nearly 10,000 nautical miles of cable across the Pacific Ocean. The cable is laid in sections running from San Francisco to Honolulu, from Honolulu to Midway, Midway to Guam, Guam to Manila, and from Manila to Shanghai. This will not be the first cable across the Pacific, making complete the circuit of the world for cabling purposes. The British Pacific cable running from Victoria to Fanning Island, to Fiji, to Norfolk, to Southport and to Doubtless Bay, was completed October 31, 1902. The line was opened for commercial business during the first decade of December, 1902. The length of the British Pacific cable is 7900 nautical miles. A detailed description of the laying of the American transpacific cable is given by the writer in the *Journal of Electricity, Power, and Gas*, San Francisco, Cal., January, 1903.

Through the courtesy of Mr. Clarence H. Mackay and Mr. Geo. H. Ward the Weather Bureau office at San Francisco was enabled to test the value of weather reports from the Pacific Ocean. The following table gives the daily run of the ship and her position at noon, ship's time, when weather reports were cabled:

Date.	Position.		Total cable laid.	Soundings.
	Lat. N.	Long. W.		
1902.	° ' "	° ' "	Miles.	Fathoms.
December 15.....	37 8	123 47	77	1,800 Mud.
16.....	35 50	126 44	259	2,550 Yellow ooze.
17.....	34 36	129 59	455	2,700 Brown ooze.
18.....	33 14	133 30	662	2,685 Do.
19.....	31 39	136 46	865	2,550 Do.
20.....	30 18	139 38	1,054	2,480 Do.
21.....	28 44	143 2	1,269	2,725 Do.
22.....	27 7	146 16	1,480	2,820 Do.
23.....	25 39	149 8	1,677	2,880 Do.
24.....	23 57	151 20	1,894	3,016 Do.
25.....	22 22	155 23	2,109	2,426 Do.
26.....	21 18	157 50	2,238	450 Do.
	{ Honolulu * }		{ 2,238	

Connections at Honolulu, 38 miles; in all, 2276.317 nautical miles.

\*Hawaiian standard time is based on standard meridian, 157° 30', or ten hours and thirty minutes west of Greenwich. Honolulu local mean time is ten hours and thirty-one minutes slow of Greenwich. San Francisco local mean time is three hours and ten minutes slow of Washington.

NOTE.—The United States Coast and Geodetic Survey is now sending a series of time signals over the cable for determining longitude of Honolulu. The exact time difference has doubtless been determined to a fraction of a second.

While the cable was being laid communication with the shore was restricted to one hour in every twenty-four, as a rule the hour beginning with the ship's noon. Insulation tests of the cable were made every five minutes. The first report from the *Silvertown* was received on December 15, when the vessel was about ninety miles off shore. An interesting fact is that the steamer was experiencing strong southeast winds with rain, while at San Francisco, ninety miles to the northwest,<sup>1</sup> the wind was northwest and weather cloudy. At Point Reyes Light, however, thirty-five miles northwest of San Francisco, the wind was southeast. The wind was also from the southeast at Mount Tamalpais. It appears then that at San Francisco there still existed a stream of air flowing near the surface of the earth from the great valley to the sea, while within comparatively short distances, both horizontally and vertically, air currents were moving at an angle of 90° with this. The wind at sea was southeast.<sup>2</sup> The second message received from the *Silvertown* indicated the existence of a disturbance off the coast of southern California, with strong northwest winds prevailing at sea. The pressure conditions shown on the forecast map a few hours later indicated the probable approach of a storm which would reach the coast south of Point Conception and move eastward across southern California and Arizona. Fore-

casts of rain for southern California and of fair weather for northern California were issued. By the morning of December 17 the rainfall at Los Angeles amounted to 1.34 inches; at San Diego, 1.72 inches. In northern California no rain fell.

The third message received from the steamer, December 17, while in 34° 36' north and 129° 59' west, indicated the passing of the disturbance at sea; terrific seas had prevailed all night of the 16th, followed by a heavy swell on the 17th, with partly cloudy weather. Conditions were still favorable for rain along the Mexican boundary, and forecasts were made in accordance therewith. All succeeding reports indicated fair weather for California.

We now know that at Honolulu the lowest pressure, 29.73 inches, occurred on December 10, and that a disturbance was then passing eastward over the Hawaiian Islands. It is also noticed that Mauna Kea and Mauna Loa were heavily covered with snow in the storm of the 11th to 13th. It may be inferred that the disturbance from the Hawaiian Islands moved slowly northeastward across the Pacific in six days, the average velocity being about fifteen miles an hour. It is of further interest to note that this disturbance apparently preserved its identity in crossing the United States. In the *MONTHLY WEATHER REVIEW* for December, 1902, on Chart II, "low" area marked "No. V" is doubtless the same disturbance which reached the Pacific coast near San Diego on December 16, 8 p. m. This disturbance is charted as leaving the United States near the mouth of the St. Lawrence on December 22. It would be interesting to know the further history of the disturbance.

## THE EARTHQUAKE OF JUNE 2, 1903, AT WASHINGTON, D. C.

By C. F. MARVIN, Professor of Meteorology.

At 8<sup>h</sup> 27<sup>m</sup> 0<sup>s</sup>, June 2, 1903, the new Omori seismograph at the Central Office of the Weather Bureau began the registration of an earthquake which is the second one recorded since the apparatus was set up in February of this year. The disturbance was inappreciable to ordinary sensations, but it is evident from the record that at its origin it was undoubtedly of very considerable severity. It is also seen that the movement of the earth had traveled a long distance before reaching Washington.

The reader is referred to section C of fig. 1, page 126, of the *March Review* for an illustration of an earthquake record by the Omori instrument. The present record, which is not reproduced, is very much longer and shows much more complex movements of the earth than in the earthquake of March 15. The following table gives the times of occurrence of the principal features of the record:

June 2, 1903, (75th meridian time).

	H.	m.	s.
First preliminary tremor.....	8	26	32
Second preliminary tremor.....	8	33	8
Principal portion began.....	8	43	2
Principal portion ended.....	8	48	49
Duration of the end portion.....	0	43	28
End of earthquake.....	9	32	16
Total duration.....	1	5	46
Maximum double amplitude of strong waves in the principal portion, 0.22 millimeter.			
Period of the pendulum, 26 seconds.			
Magnification of record, 10.			

## AUTUMNAL COLORATION OF FOLIAGE.<sup>1</sup>

By Mr. A. F. WOOD, Pathologist and Physiologist, Bureau Plant Industry, U. S. Department of Agriculture.

The production of color in autumn foliage is, as is well known, due in part to the gradual destruction of the chlorophyll when the leaves have reached maturity and approach the

<sup>1</sup>Northeast. (?)

<sup>2</sup>In the opinion of the district forecaster, the wind directions at San Francisco are largely influenced by the peculiar topography of the district.

<sup>1</sup>Advance copy from an article on Autumnal Coloration in the *Encyclopedia of Horticulture*.—Ed.